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Situational Interest In Professional Development

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SITUATIONAL INTEREST IN PROFESSIONAL DEVELOPMENT

by

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Abstract

In this case study we look at three cases of situational interest during a teacher professional development workshop. The cases were selected because they illustrate events where multiple teachers exhibited spontaneous interest in a geologic feature or phenomena. This research was conducted at a three-day professional development workshop on the seashore in the northeastern part of the United States. The professional development involved 17 middle school teachers who spent the three days at three different locations learning about the geologic history at those locations. In this study, we express the signs of interest shown by the teachers in each case and then compare and contrast the commonalities in the cases themselves. The study ends with a list of implications for future professional development to increase situational interest.

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Definitions

Situational Interest- spontaneous, transitory, environmentally activated, and context-specific

Personal Interest- intrinsic desire to understand a particular topic that persists over time

Self-Determination Theory- when a person is motivated by ones own control and endorsed by ones sense of self; this is linked to intrinsic motivation because the more intrinsically motivated you are the more self-determined you are

Intrinsic Motivation- behavior is motivated by ones own control and based on basic human needs, such as competence, relatedness, and autonomy

Extrinsic Motivation- motivation comes because doing something will lead to a separate outcome

Pistachite- green mineral with crystalline structure that formed on diabase dikes

Dikes- (diabase dikes in this study) created when molten magma flowed into cracks in the granite and solidified to form rock

Convection Currents- located inside the mantle, these are a theory for why plates move; molten rock that is near the earth's surface cools and sinks, then those same rocks are heated by the earth's core and rise again, creating currents

Introduction

A group of science teachers were at a professional development conference in a beautiful geological area in the northeast of the United States. They were taken to different sites in the area to study the geologic features that were created at different points in time. On the first day, one of the teachers spotted an interesting rock; it sparkled and was of a green color. Much conversation and debate ensued about this rock. This interest in the green sparkly rock was spontaneous and spread among other teachers. Though this was not a planned part of the curriculum, this rock, called pistachite, became a topic of conversation among most teachers. The voices of the teachers had more inflection and became louder when talking about pistachite. Also, the teachers talked about pistachite with others teachers during the lunch break who were not involved in the professional development. What caused this increased and spontaneous interest? In this case study, we ask this question for the pistachite situation and two other situations where teachers showed similar interest. There is evidence that interest is related to learning (Hidi, 1990), and thus, studying how to increase interest is important. The Next Generation Science Standards (NGSS) aim to improve the teaching and learning of science so therefore improvement of professional development for science teachers is also important. Our goal is to find similarities in these instances of situational interest in order to make suggestions that will promote interest in future professional development.

This Study

For this comparative case study, we examined three different events where teachers exhibited situational interest. Each case represents an event when multiple teachers expressed interest in a geologic feature or phenomena. The interest in that feature is referred to as an “event.” The analysis of the event focuses on the point in time when teachers first became interested in that geological feature or phenomena. The analysis of the signs of interest come from the event itself and when referring to the event afterwards. We also analyze the interest of teachers who were not involved in the event but showed signs of interest after the event.

The first case of situational interest was a discussion about pistachite. Pistachite is a green mineral teachers noticed on the surface of some of the rocks in the area. Teachers became interested in the mineral on the first day, before they knew the name of the mineral. Pistachite continued to be discussed in the field and in the classroom when reflecting back on the week. Signs of interest for this event occurred throughout the professional development, while data were collected and when data were not actively collected (such as at lunch). We refer to this case of situational interest as “pistachite.”

The second case of situational interest involves a discussion between Teacher K and Teacher B about a series of diabase dikes that cut through the granite bedrock in the area. This occurred on the second day in the field, at the same location they were at the day before. Teachers were asked to draw the rocks and location of the rocks in a general area. When the teachers were asked to head back to their cars to drive to the next location, some of the teachers decided to follow a dike into the woods instead. We refer to this case of situational interest as “dikes.”

The third case is a discussion about convection currents. This event is when a group of teachers showed interest in how tectonic plates changed direction (the change in the convection currents) while figuring out what happened between three times in

Maine's geologic history. This occurred on day three when the teachers were creating their second set of models. We refer to this case of situational interest as "convection currents."

There were likely more than three cases of situational interest during the week. For example, on day three there was an instance of a teacher who was interested in Pangea and how it fit into Maine's geologic history. Based on the time spent on the subject and the questions the teacher was asking a geologist this was also likely an instance of situational interest; however, we chose not to analyze this event because only one teacher was involved in this event and we chose to focus on cases that involved multiple teachers.

In the end, we chose to analyze three events because they were the clearest cases of situational interest we observed in the data corpus. Further analysis confirmed teachers' interest. For convection currents, we originally analyzed one teacher who was outspoken on the audio recordings. However, after listening to the recordings several times, we noticed the whole group showed similar signs of situational interest to the outspoken teacher. We selected pistachite because the instructors' recollection was that this mineral was mentioned over and over. Also, another researcher, who was not involved in this professional development, was a part of informal conversations at lunch about pistachite and this was further anecdotal evidence of interest. We selected dikes because this event of the teachers following a dike into the woods stood out for the instructor. Though dikes were a part of the original curriculum plan, having teachers investigate how far they extended into the woods was not a part of the curriculum, so when the teachers left the group to explore the length of the dikes, this stood out to the instructor. Also, this excursion was mentioned in an interview with one of the teachers a month after the professional development.

These events occurred at different times of the week and in different locations with different instructional tasks given to the teachers. This study looks at the differences and similarities among these events to hypothesize ways to increase the chances of situational interest in future professional development. This kind of situational interest during professional development workshops is important because the event that sparks interest is memorable for the teachers and since situational interest is based off spontaneity and external factors, it is relevant to the design of future professional development workshops.

Type of Interest

In this study, we looked at the interest displayed by the teachers. We refer to this as *situational interest*. In this case the teachers were in a field geology environment where they exhibited volition over a short period of time, therefore their interest was best captured by notion of situational interest (Schraw, 2001), as compared to intrinsic and extrinsic motivation or self-determination theory (Deci, 1999).

It might appear as if self-determination theory is relevant given the importance of intrinsic and extrinsic motivation in learning, but our study focuses on external factors. Self-determination theory and intrinsic and extrinsic motivation are strongly linked because self-determination theory is based on the ratio of how intrinsically motivated you are in comparison to how extrinsically motivated you are (Deci, 1999). Intrinsic motivation is when behavior is motivated by one's own control. The more intrinsically motivated one is, the more self-determined she is, because outside factors (extrinsic motivation) are not causing the behavior. Self-determination theory explains when a person is motivated by one's own control and endorsed by one's sense of self (Deci, 1999). The other type of motivation would be described as a controlled behavior, or being controlled by external factors. For example, one has controlled behavior if they are motivated to do homework because they want a good grade, not because they have a desire to learn the material. Both are motivated and intentional but their processes for regulation are very different. Intrinsic motivation is based on basic human needs. A person is motivated by the psychological needs that are inherent in human life, such as competence, relatedness, and autonomy (Deci, 1999). Contrary to intrinsic motivation, extrinsic is when the motivation will lead to an external outcome, such as reading a book to get extra credit instead of doing it to learn the material.

In this study, we looked at individuals whose interest in a particular subject increased, in this case their interest in bedrock geology, as related to external factors. Though intrinsic motivation is related to learning (Deci, 1999) and we are concerned with learning, we are not concerned with how the teachers were motivated, only that they were interested in the materials. We collected data that would help us understand external factors that contributed to situational interest. In this data set we are unable to study how much teachers are intrinsically motivated. We concentrated on external factors that future professional development instructors can use to produce interest in future professional development. Studies show that interest is related to learning (Hidi, 1990), so we concentrated on the fact that interest was present, and did not analyze each teachers' internal interest. We looked at situations where the teachers were asked to study and present on subject matter in a very short period of time, thus situational interest fits this case study best.

Situational interest has been assumed to be transitory, environmentally activated, and context-specific (Schraw, 2001). This is unlike personal interest, which is characterized by intrinsic desire to understand a particular topic that persists over time. In this study, because the teachers' interest was provoked spontaneously and in a specific context, situational interest is an appropriate lens. However, we have evidence from an interview with one teacher that suggests she was still interested in the topic (dikes in her case) after the professional development workshop ended. This interview data could be taken as evidence of personal interest and not situational interest because personal interest is defined as a want for continued understanding of the topic. However, the teacher's description of the event took the form of a synopsis of an interesting topic during the professional development, she did not express a desire for continued understanding, therefore this indicates situational interest and not personal interest.

Situational interest has mostly been studied in the context of reading literature (Schraw, 2001), though the definition fits this case study despite the different research settings. It is described as short-lived, context-dependent, and easier to manipulate than personal interest (Schraw, 2001). In this study, we are concentrating on finding out what factors connect these cases of increased interest in order to present those factors to those planning future professional development. Because situational interest is based on internal and external control, we can give factors that instructors can control and factors that help to create autonomy and make subject matter meaningful to future teachers (Deci, 1999).

Research Questions

This research attempts to answer two research questions: 1) Was there interest at these three cases and what did it look like? 2) What instruction was given, what type of environment were the teachers in, and how did the timing of the three cases compare to one another? These questions were created after preliminary analysis indicated interest in these three cases. After giving evidence of interest, we hypothesized a connection between the three cases. Answering the second question will provide suggestions for how to support science teachers' interest in future professional development.

Methods

Setting

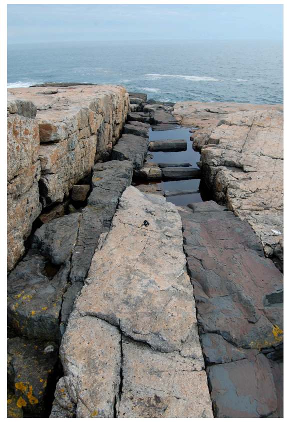
This research was conducted at a three-day professional development workshop in a rural location along the seashore in the northeastern United States. The workshop was led by a team of geologists and education researchers. The primary instructor had a background in geology and education. Seventeen teachers participated in the workshop. The teachers had a history of working together and working with university personnel as part of a National Science Foundation (NSF) funded Math and Science Partnership. They were all middle school earth science teachers and were all using the same curriculum (SEPUP, 2012).

Geology

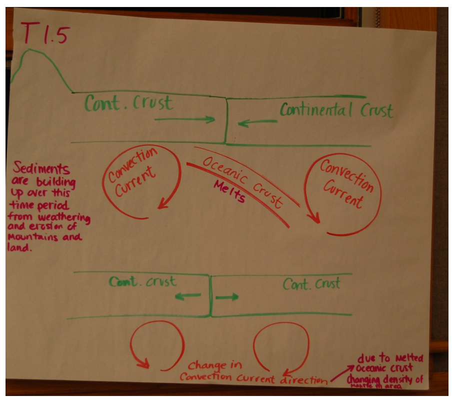
The three events are based on geologic features or phenomena teachers observed and discussed during the professional development. These were: pistachite, dikes, and convection currents. Pistachite (see Picture 1) is a green, crystalline, silicate mineral similar to epidote. It is a mineral of secondary origin that forms from the alternation of other minerals. Pistachite forms as hot water seeps into cracks in rocks dissolving minerals, that are later precipitated (Capps, 2014). Pistachite is often found in cracks on bedrock. Dikes, in this case diabase dikes (see Picture 2), were created when molten magma flowed into cracks in the granite and solidified to form rock. Diabase dikes are similar to basalt dikes; however, diabase has coarser crystals as it forms further underneath the Earth than basalt. The intrusions create wedges of stark contrast from the darker diabase dike to the light granite (Capps, 2014). Convection currents inside the earth (see Picture 3) are a possible answer to a fundamental question in geology about why the tectonic plates move. The hypothesis is that plates move because molten rock that is near the Earth's surface is cooler and therefore denser than the rock closer to the core of the Earth. The rock near the surface then sinks, and those same rocks are heated by the Earth's core and rise again, creating currents, which in turn move the plates.

Picture 1. *Pistachite* (Barth-Cohen, 2013)

Picture 2. *Diabased Dike* (Barth-Cohen, 2013)



Picture 3. *Model with Convection Currents* (Barth-Cohen, 2013)



Instruction

The focus of the instruction was on working with the Next Generation Science Standards [NGSS](Achieve, 2013) scientific practice "developing and using models." The teachers spent time at three different field locations. Based on their observations at these locations they were asked to create models of three different time periods. See Table 1 for more details on when teachers were at these locations. The oldest time period was ~400 million years ago, the middle time period was ~200 million years ago, and the youngest time period was ~20,000 years ago. The workshop involved working both in the field and in the classroom. While in the field the teachers observed rocks from the three different time periods at three different locations. The geology at the first location (see Picture 4) showed signs of what happened in the oldest time period. The geology at the second location (see Picture 5) showed signs of what happened in the middle time period. The geology at the third location (see Picture 6) showed signs of what happened in the youngest period, the glacial period.

Each day the teachers had different tasks in order to build up their knowledge to create their models. The first day of the professional development was spent working in the field at one location and drawing freeform models of the geological history at that location. On the second day, the teachers spent time at two new locations, as well as returning to the location from the first day. They then spent time in the classroom creating models of the three time periods. During the fieldwork teachers were instructed to make observations of the rock and include those observations in their models. On the third day, they were asked to draw models of the time periods in between the models they created on day two. In addition, on the third day they had access to additional resources, including a variety of digital and conventional maps, including bedrock maps and surficial geology maps.

This study focuses on three separate cases in the data set. The first focus is on Day 1 when teachers became spontaneously interested in pistachite. The second is on Day 2 when a few teachers left the group to follow dikes into the woods. The third was on Day 3 when teachers were in the classroom creating their second set of models and a small group of them became interested in convection currents.

Table 1. *Timeline for Professional Development and Data Analysis*

Day	**Time**	**Location**	**Data Analyzed for Case**
Day 1	Morning	Fieldwork- location 1	Pistachite- first observed
		Classroom	
	Afternoon	Fieldwork- location 1	Pistachite- sign of interest
		Classroom	
Day 2	Morning	Classroom	
		Fieldwork- location 2	
		Fieldwork- location 3	
		Fieldwork- location 1	Dikes- left group and followed dike Pistachite- signs of interest
	Afternoon	Classroom	
Day 3	Morning	Classroom	Convection Currents- first discussed Convection Currents- signs of interest
Day 3	Afternoon	Classroom	Pistachite- signs of interest Dikes- signs of interest

Picture 4. *Fieldwork- Location 1* (Barth-Cohen, 2013)

Picture 5. *Fieldwork- Location 2* (Barth-Cohen, 2013)

Picture 6. *Fieldwork- Location 3* (Barth-Cohen, 2013)

Data Collection

In total there were 17 hours of instruction split between the fieldwork and classroom, all of which was documented with audio and video data. Also, we collected copies of teachers' field notes and models and copies of the researchers' field notes about the teacher's experiences and learning about both modeling and geology. In this study we focus on the audio and video from Day 1 in the field, Day 2 in the field, and Day 3 in the classroom. We also focus on the models teachers created on day three, the photographs taken while in the field, the instructors' notes, and an interview of one teacher, Teacher K, conducted a month after the professional development. We only have one interview with this one teacher.

Participant Selection

Our analytical focus was on three teachers who were the most vocal about their interest related to the cases previously described. Although other teachers were also involved and showed signs of interest, these three teachers showed signs of leading the cases of interest in question and were involved in many discussions of the topic of interest.

Analysis Methods

The study used a bottom up grounded approach to data analysis (Charmaz, 1995). The first preliminary analysis of the data was for another set of research questions, focusing on teachers and modeling. It concentrated on Day 3 when the teachers created models of what happened in three different geologic times. During the preliminary analysis I looked for similarities and differences in the final models that were created by the teachers on that day. This revealed two major differences. One group chose to include convection currents and another group included the chemistry of the rocks. I analyzed the data from when the teachers were working on their models. I noticed the group of teachers showed strong signs of interest in how the plates moved. After speaking with other researchers who attended the event, we identified two other potential cases of high interest. I then analyzed the work time for each case, and when the teachers were discussing each case afterwards.

After this preliminary analysis of all events, I categorized the signs of interest into eight different categories. These signs of interest were created by the researchers from the data. We did not look at other research literature before coding, but later found other research literature that supports these eight categories. When we saw signs of situational interest, we asked the question, “How do you know interest is occurring?” The eight categories were created off this question. Signs of interest we coded for were: verbal signs, non-verbal signs, questioning, repetition, longevity, involving others, autonomy, and time spent. Not all eight signs of interest are used in each case, only the signs of interest that are best represented in the data for each case were included. 1) Verbal signs of interest include phrases that suggest interest, such as “That’s so cool!” 2) Non-verbal signs of interest include higher inflection in the voice, a teacher speaking louder, and hand motions accompanying speech. This also included sitting up closer, leaning in, and nodding his or her head, when someone else was talking about the case. 3) Questioning was coded whenever a teacher asks a question. In convection currents and dikes, the questions were more about the science of the event, such as "How did that move?" and "How far did that go?" For pistachite, the questions are less about science and mostly about involvement of others, such as "Did you see that patch over there?" This, along with the repetition of both types of questions, is a strong indicator of interest in all three events. 4) Repetition does not just occur with teachers repeating questions, but also with repeating verbal phrases of interest, such as "How cool!" 5) Longevity is how long the case was still of interest for the teachers. With pistachite and dikes, both events started on the first day (for dikes, following the dike happened on Day 2 but they first saw and wrote about that dike on Day 1) and continued to be of interest for the rest of the professional development. Pistachite continued to be brought up in discussions in the field, along with at lunch and breaks. Both dikes and pistachite were also discussed on the last day when the instructor asked teachers to reflect on what stuck out the most for them throughout the week. Convection currents occurred on Day 3 of the three-day professional development, but we do have an interview with Teacher K a month after the professional development that shows continuing signs of interest. Teacher K was the only teacher interviewed at that point in time. Given only one interview with one teacher, that interview is not a strong indicator for longevity of interest in convection currents. However, during that one interview, all three events (pistachite, dikes, and convection currents) were discussed. 6) Another sign of interest was involving others. This occurred with pistachite, when telling other people about what they saw and showing others. This was done because the teachers wanted to share the mineral with others. Involving others was not coded for in the other cases because it is not a main theme in the data for dikes and convection currents. Teachers following the diabase dike was not known to all teachers, and convection currents were presented to the whole group when they presented their models so we cannot know if they would have involved others in their discussion on their own. For pistachite, everyone knew about this mineral, regardless of whether they had seen the mineral or not. 7) Autonomy was a major sign of interest for the dikes case. We describe autonomy as going out on ones own and doing something on ones own. For dikes, this is when the teachers went away from the group to look at dikes and when they researched dikes on their own. 8) Time spent is quantitative data of the minutes spent on the case of spontaneous interest during the event compared to the whole amount of time allotted. This pertains only to convection currents, because the other events occur over multiple days and were not in a confined enough environment to analyze this.

Analysis of Three Cases of Situational Interest

In this section, I give evidence for the situational interest shown at each event. I also explain what occurred during each event. The end of the section is a comparison of the events. This is the basis for the recommendations for future professional development that are expressed in the discussion section. Throughout the analysis there are transcript excerpts from the relevant audio, however more complete transcripts are included in the Appendix.

Pistachite

Description of Event

This section gives the description of the event of pistachite on Day 1. This includes the environment, instructional task, and what the teachers were doing. This description will be used to compare the three events.

Pistachite was first observed early on during Day 1, though the teachers were not actually told the name of the rock until later in the day. The discovery of pistachite occurred in the morning at the first location where teachers were given the task to explore the area and look at the rocks. "Ok morning session, the goal is about 45 minutes from now give or take a few minutes meeting down that way and there will be people down that way too you can't miss it" (lines 1-3). The instructor gave no specific instructional task, other than to explore the area for 45 minutes. The task was broad and encouraged teachers to pursue what interested them. Teacher G discovered pistachite. We have data of her discussing a rock that we think is pistachite (lines 7-9) but we do not have any data of the geologist telling her the name of the rock is pistachite. We know it happened during the break between the two morning sessions though because in the afternoon session Teacher G says, "I hope we talk about pistachite"(line 10). During this morning session, teachers walked around and discussed the rocks with other teachers, along with geologists. They had the ability to explore whatever section of the rocks they wanted to, as long as they met in the pre-designed location 40 minutes later.

Signs of Interest

The event *pistachite* occurred throughout all three days of the professional development. However, the majority of the signs of interest that I focus on in this analysis occurred on Day 2 and Day 3. Specifically, the analysis concentrates on one teacher, Teacher G, but most teachers at the professional development showed signs of interest in addition. There are six major signs of interest that were included in the coding for pistachite: verbal signs, non-verbal signs, questioning, repetition, involving others, and longevity. There were many instances sporadically throughout the three days when teachers exhibited signs of interest about pistachite. These instances include the morning of Day 2 and an extended classroom discussion of pistachite on Day 3. For a complete timeline on the analysis of pistachite, see Table 1. These instances of interest in pistachite were included in the analysis because they best captured teachers' interest given their clarity; however they are not the only instances of teachers exhibiting interest in pistachite. In this section, I give evidence for the six major signs of interest from some teachers and give evidence of interest from most teachers. Table 2 shows a summary of this analysis.

When analyzing the recording from the field, we heard many phrases of interest. The first phrase of interest occurred on the first day, the session after learning what pistachite was. Teacher G stated, "I hope we talk about pistachite." On Day 2, while writing down observations of the rock structures, Teacher G found a patch of pistachite and many teachers joined in looking at the rock (lines 70-88). Teacher P stated, "This is so awesome." Teacher G said, "Oh cool. Look at the size of the crystals on that!" After more voices appear on the recording, Teacher L says, "I want to see I want to see!" Teacher G says, "I'm glad I got to see more of it," and finishes the conversation with, "wowwww." All of these sentences are examples of phrases of engagement teachers said about pistachite. These phrases also occurred on the third day when Teacher G was asked what she found most interesting during the professional development. She chose to talk about pistachite. Teacher G stated, “Once I found it I saw it everywhere. It was so cool.”

Non-verbal evidence is a major piece of evidence for interest in this section. As most of the data collected for this event is on digital recorders, non-verbal signs include higher voice inflection and louder speech. When teachers were videotaped (Day 3), we analyzed hand movement and body language. When talking about pistachite, Teacher G would be talking to one or more teachers then see pistachite and Teacher G’s voice would become louder on the recording. For example, on Day 2 in the field, the teachers were discussing the layout of the rocks when Teacher G saw pistachite. “Ohhh ho ho, this looks like pistachite. Yeah that’s not lichen that’s crystals. That’s not vegetable!”(lines 170-172). Also, the noises on the recording become louder and more teachers’ voices are apparent on the recording. Teacher G’s voice also becomes more animated, dragging out words and adding sound effects.

In this section, teachers asked questions to each other about their involvement in pistachite. These questions include: “Did you get to see the pistachite?” and “Did you see that patch over there?” This type of interest seemed to be because of the novelty of the pistachite, and not the science behind the pistachite. This is also shown in the amount of repetition in phrases. Teacher G repeats herself multiple times in the same part of the data (lines 180-184). Repetition suggests that she was intrigued because she had never seen or heard of anything like it. This is supported by an informal conversation between the researcher and Teacher G three months after the professional development. Teacher G brought up the pistachite on her own accord and the research took field notes on the conversation. She stated that she could not believe the name and that she had found something new. Also, once she first spotted it and realized what it was, it was like it was everywhere.

Pistachite continually arose throughout the professional development, including when data were being actively collected and when no data were being collected. The major times that we analyzed are discussed below. It is first found on the morning of the first day while in the field. It was talked about again that day during on of the breaks. We know this because that is when Teacher G found out the name of the rock. On Day 2, the teachers become focused on finding more pistachite when asked to look at the dikes. On the same day, pistachite was discussed at lunch with other teachers who were not involved in this professional development. On Day 3, pistachite was discussed when talking about what sticks out from the professional development (lines 315-356). Pistachite was also discussed by Teacher K in an interview a month after the professional development (lines 357-359) and four months later with Teacher G while she was having an informal discussion with the researcher. During the interview with Teacher K, she was asked what science teachers were interested in and she stated, “And then of course (Teacher G) with her pistachite. Of course that was a totally different thing but, um, there was definitely good science going on”(lines 357-359). Teacher K recognized that pistachite was not a major scientific component but that it was of interest to Teacher G. Four months after the professional development, a researcher was involved in an informal conversation with Teacher G where she recalled her experience during the professional development. From the researchers informal notes, Teacher G stated that she became interested in the fact that she had discovered something she had never seen before. She knew it was like lichen but not exactly so she pursued it more and discovered something with a really cool name. In both cases, the interview with Teacher K and the discussion with Teacher G, neither teacher was prompted by the researcher to mention pistachite. In both cases the teachers mentioned it on their own.

To summarize, though Teacher G was the focal point of the analysis of this event, most teachers were involved in the discussion of pistachite and showed interest, including teachers who were participating in a different professional development but shared breaks and some activities with teachers from this professional development. One of the researchers who did not attend this section of the professional development heard about pistachite during lunchtime from teachers who were participating in this workshop. Teachers were discussing it during other breaks as well. It was during a break when Teacher G was finally told the name of the rock by one of the geologists. During the professional development, other teachers showed interest because of their voices appearing on the recording, as previously discussed. In the interview from a month after the professional development with Teacher K, she brought up pistachite on her own as something she remembers being of interest to Teacher G during the professional development (lines 357-358). Though she did not indicate being interested in the rock, she notes that others obviously were interested. All of these pieces of evidence indicated that many teachers were interested in this event.

Table 2. *Signs of Interest for Case 1- Pistachite*

Signs of Interest	**Examples of signs of interest from data**
Verbal	"Oh look at that!" "I'm glad I got to see more of that"
Non-Verbal	Inflection in voice, louder
Questioning	"Did you get to see the pistachite? It's going through all the granite over there."
Repetition	Repeated phrases: "That's so cool" Repeated Questions: "Did you see that patch over there?"
Involving Others	"There's a huge patch over here… oh yeah look at that!" Increased number of people on recording.
Longevity	Continually comes up while in the field, in the classroom, and during breaks, on all three days.

Dikes

The event *dikes* occurred on Day 2 while in the field. Dikes are a concept that the instructors focused on during the professional development. On Day 2 dikes had already been discussed and were focused on for the rest of the professional development after this event. This event was when three teachers left the entire group to follow a dike inland to see how far it continued. The teachers were a half hour late to the next location because of this excursion. Though only three teachers and one of the geologists were involved in this excursion, there was evidence that other teachers who heard about this event were also interested. Evidence of the other teachers' interest showed up in the transcript and will be discussed later in this section.

Description of Event

This event took place outside in the morning of Day 2. The teachers were walking to their cars to move onto the next location when Teacher K noticed a dike going into the woods; three teachers and one geologist chose to follow the dike into the woods that connected to the parking lot above instead of continuing on to their vehicles. They even noted that their rides would leave without them. During the time before teachers were asked to move on to the next location, teachers had been drawing what was occurring during the three different time periods by the evidence they saw in the geology of the rocks. The instructor asked the teachers to meander around “kind of slow our activity of getting things on paper. So, you will make a map and last time we had a really specified area, this time we are going to do a little different and what I really don’t mind is if we put these things together…” (lines 11-27). Teachers were given a half-hour to work on these drawings. Once they were asked to walk towards the cars, teachers continued to discuss what they saw in the rocks with each other and one of the geologists until they saw the dike that went into the woods and followed it. The dike was not easy to follow because it was covered by vegetation. Throughout the time outside they were given notepads and pencils to draw with.

Evidence of Interest

There are four major signs of interest shown by the teachers while discussing this event. These signs are: verbal signs, non-verbal signs, autonomy, and questions. In this section, I present evidence of interest from two groups of teachers, those who followed the inland dike and those who were not in the group that followed the dike but still heard about the event. Table 3 shows a summary of this analysis.

During the event, there are many verbal signs of interest. Teacher K yells, “NEAT!” when first looking into how far the dikes go inland. Teacher H follows Teacher K by saying, “That’s pretty cool.” At the end of the excursion, Teacher B says, “That was really cool,” and Teacher K calls it “amazing!” (lines 116-148). Also, Teacher K showed verbal signs of interest in her interview a month after the professional development. She said, “I think the time I thought it was REALLY cool was when… down the end of the beach where we had that REALLY large basalt intrusion” (lines 433-456). She then discusses what happened when they followed the dike inland.

There are many non-verbal signs of interest in the recordings from the excursion and in the video data from Day 3 when they recall the event. During the event, teachers’ voices go up and get louder, and words are drawn out. Teacher K says, “Such a mismatch!” when discussing the basalt as it compares to the granite. Her voice had a higher inflection at the end. Later, she also states, “Yeah! And it goes right, yeah! It goes across.” She was talking about where the dike leads. When discussing this event on Day 3, the Teacher K and Teacher B started to talk with their hands to describe what happened (lines 270-314). One example of this was Teacher B discussing where the dikes went. “We went the other direction so we could check out the upper parking lot and saw it went beyond that and we were like ah (?) so then we went around the corner (pointing forward, then straight ahead and to the left)” (lines 277-280). Another example was Teacher G, who did not go on the excursion with Teacher K and Teacher B but remembered seeing the same dike. Below is part of the transcript of Teacher K and Teacher B explaining follow the dike across the parking lot. This section was when Teacher G starts to participate in the conversation:

281	Instructor:	so there you were at first making your model here and then you looked
282		at the thing online and were like ‘huh that looks like here’
283	Teacher K:	see if it does
284	Teacher G:	did it?
285	Both K/B	YEAH!
286	Teacher K:	right up into the soil, the hill, and the parking lot
287	Teacher G:	you could see that fair? (hands up and strait, showing distance?
288	Both K/B:	yeah!
289	Teacher G:	(head nodding)
290	Teacher K:	its right there at the stairs, right that one big thing.
291	Teacher G:	(sits up and turns towards Teacher K)
292	Teacher K:	So then you go to the first part of the line, ok, and then you go up those
293		stairs to the next parking lot.
294	Teacher G:	(nodding head) yeah
295	Teacher K:	there’s the blueberries and other stuff you can see. Go into the
296		blueberries, so go around (fingers pointing ahead, one hand goes
297		around her head) so you see it coming out (hands pulled in), and then
298		across the road and it goes up into the hill (hands go out strait).
299	Instructor:	so that was a cool discovery
300	Teacher G:	(while instructor is talking) how dare they put a parking lot over there!
301		(hand slams on desk)
302	Instructor:	so what did that make you think about, while you were doing that?
303	Teacher G:	what the heck was going on back then?

Teacher G showed interest by sitting up in her seat and turning towards Teacher K as she talks (line 291) and she nods her head (line 294). She also interrupted the instructor to say, “how dare they put a parking lot over there! (Hand slams on desk)”(line 300-301). She was talking about the parking lot being paved over the dike. As shown in the interview in the previous paragraph, Teacher K also showed non-verbal signs of interest when discussing this event. She said, “I think the time I thought it was REALLY cool was when… down the end of the beach where we had that REALLY large basalt intrusion” (lines 433-456). She emphasized words more when describing this event.

The reason this event was selected was because it stood out in the instructor's mind because of how autonomous it was. When one of the teachers from this group was interviewed a month later, she said, "I remember thinking we shouldn't leave but no one is watching and I want to find out." She left the group because of her desire to find out how far the dike go inland. Comparable, the teachers were not late to any other events, including coming back from lunch or a scheduled break. Also, the teachers had researched on the computer where the dikes lead, so they had interest in this before the event happened. "We had been looking at the big dike (?) and we here, back in here in between, and we could see that oh well that looks like it somehow is at where we are right this minute (in the classroom) so when we got back there (we followed the dike)"(lines 271-274). They looked at maps on their computer during their free time. When given the opportunity to pursue their interest in dikes the next time they were at the same location as Day 1, they took it. This was shown in the transcript from when they reflected on the event the next day. They were willing to show up late to the next location in order to satisfy their curiosity.

Another sign of interest was questioning. As talked about in the last paragraph, the teachers were very interested in answering the question, "how far do the dikes go?" They expressed this question during the event, a day after the event, and in the interview. When chasing the dike, the teachers asked many scientific questions about what they were seeing and discussed it with each other. Teacher K said before they started to follow the dike, "That's what I was trying to figure out this morning. If we went inland more would we see it"(lines 109-110). In lines 120-126, the teachers discuss following the dikes to find out if they were composed of diabase, which the instructor had mentioned previously. On Day 3, Teacher G asked questions to Teacher K and Teacher B when they are talking about the event. She asks, "Did it?" "You could see that far?" and "What the heck was going on back then?" She became interested in the event and asked questions like the other teachers did during the event. During the interview, Teacher K expressed a desire to continue looking into dikes and how much distance they can cover (468-481). She asked questions, which expressed that she still wanted answers: "You know can we find those anywhere else on the peninsula? Are they up high? Are they up on (location they were), up on the hill somewhere?" (lines 468-470).

Though only three teachers went chasing after the dikes inland, other teachers showed interest. This case was different than the previous one, because the evidence suggests that not many teachers knew about the event. On Day 3 when Teacher K and Teacher B discuss the event with other teachers, the other two teachers did not know the event happened. Some of this transcript was discussed in the previous paragraph when Teacher G was asking questions to Teacher K and Teacher B (lines 284-303). Teacher G also showed signs of interest by sitting up in her seat and using her hands when she talks. Other teachers who did not participate were not aware of it in the moment. Data of those hearing about the event afterwards though, also showed signs of interest.

Table 3. *Signs of Interest for Case 2- Dikes*

Signs of Interest	**Examples of signs of interest from data**
Verbal	During event: "That was so cool." After event: "We wanted to find out."
Non-Verbal	Hand gestures, voice inflection, louder
Autonomy	Left the whole group and went out on their own. Showed up late to the next section.
Questions	"How far does that go?"

Convection Currents

Description of Event

The event *convection currents* occurred on Day 3 while teachers were creating models of what occurred during the three geologic times in Maine's history. While talking about how the plates had changed direction, one group of teachers showed interest in the subject of convection currents and the teachers (three teachers were in this group) continued to talk about it. Though only three teachers were in this group, many other teachers showed signs of interest as well. I will first explain what occurred during the event and this explanation will be used to compare the three events. After, I give the evidence of interest from the data of both the three teachers who were in the convection current group and other teachers who showed signs of interest as well.

This event took place in a classroom. Teachers were placed at five different tables around the outside of the room with the table in the back of the room displaying a big geologic map of Maine. Snacks and coffee were right outside the classroom door and teachers were free to take a break as needed. Each teacher had his or her own computer and a smaller paper map to use.

At first, teachers were reading the maps, some on paper and some on their computer. They had access to a flash drive with maps and the internet (they were warned the internet was slow). During this time the instructor walked around the room and there was not a lot of discussion among the group. Geologist came over and looked over shoulders to explain how to read the maps. At no point did the instructor or geologists (two people) give hints to what was occurring during the time periods. They then discussed how to read the maps and what they meant. They looked at one person's computer and the instructor brought them over to the big map to discuss. They all leaned over the map, the instructor pointed at what was occurring, and they asked questions about how to read the maps and what symbols mean.

After this, they did one of the following during the work time, looked onto their own computer, got up for food or to some other reason or to just get up and looked at the computer from a standing position, asked each other questions and discuss, looked at the maps from the flash drive or the internet, discussed with the instructor or expert, looked onto each other's computers, or drew the model.

Signs of Interest

There were four major signs of interest that we coded and these together make the case that situational interest occurred at this event. The four signs of interest were: time spent on convection currents, questioning, non-verbal signs, and verbal signs. Examples of each are shown in the table below (Table 4). In this section, I will give evidence for the four major signs of interest and give evidence that other teachers who were not in the group were also interested. Table 4 shows a summary of this analysis.

The last morning block was 3.5 hours long. During that time, the teachers were given 2 hours to work on their models. In those 2 hours, 50 minutes was spent learning how to read the maps and asking the geologist and instructor questions. At the end of the 2 hours, 30 minutes was spend drawing the model and deciding what to represent and what not to represent. This group did not use all 30 minutes and finished early. This left 40 minutes of discussion on what happened during the three time periods (two models were to be created). This group spent 30 out of the 40 minutes discussion convection currents and how they could have changed direction.

Questioning was a big piece of this evidence. One teacher, Teacher K, was more vocal about asking questions, but the other teachers showed non-verbal signs of interest, participated in the conversation, or repeated questions after they were asked.

Teacher K: the convection currents, well something happened. Somehow the convection current had to have changed direction because their coming together, and they're going this way so what caused that. Was it all that oceanic stuff that was going down, did that change the currents? Because we have that whole section of oceanic crust that went down, and that might be where the basalt came from and then started pulling apart again. But changed that? What did that? What can do that? Because it had to have changed from going like this to be going like this (hand motions)… That whole oceanic that went down caused something to..

In lines 231, Teacher K asks, "But changed that? What did that? What can do that?" She continued to ask this sequence of questions, to the instructor (lines 236-242) and then to her group when she is came up with an explanation of what could have happened (lines 258-267). The group moved on to discuss how to draw the models but the teacher brought it back to how the plates moved and asked these questions again.

Though one teacher did the majority of the talking, all three teachers showed signs of non-verbal interest. When the subject of convection currents came up, the teacher talking started doing the motions with her hands of how the plates were being moved. The teacher next to her started doing those motions as well and nodded her head. The teacher farthest away sat up straighter in her seat and stopped looking at the computer in front of her. Also, the teachers were working independently with little group discussion before this subject. All attention was on the teacher discussing this when she was asking the questions, then the teachers went back to looking at their computers and discussing, and then full attention was back on the teacher speaking when she had come up with how the convection currents had changed direction (like a lava lamp).

The teachers themselves also gave verbal cues of being interested. They said things such as “That’s huge!” and saying “yes” in agreement. Also, one teacher said, “That’ too much for may brain,” and all teachers agreed and laughed.

There were only three teachers in this group but other teachers who were not in that group showed interest in this subject as well during the group presentation. After the group talked about convection currents, a member of another group asked about convection currents and how true of a theory they are and how they work with plate tectonics. After the presentation he said, “I have a question about the reversing convection currents. The mantle is really thick layer and this convection (hands moving in a circle), is it a complete layer wide thing or does it happen within?” Teacher K added that they do not know how much the convection currents take up the mantle. The geologists then explained the two theories of how plates move, convection currents and slab-pull. Both theories work on the theory of density. The teachers become interested in convection currents and how they work to make the plates move. Most teachers were nodding their head with wanting to know more or saying “yeah, how does that work,” and another teacher then asked, “if we ask ten geologist this question, how many will [say] slab-pull (causes the plates to move) and how many will say convection currents.” They then discussed how their students understand convection currents and another mechanism of how the plates could move is introduced, slab-push The whole discussion that occurred involved five other teachers who were not in the group presenting and this was the only group where people had a discussion about their model and the geologists were involved in the discussion.

Table 4. *Signs of Interest for Case 3- Convection Currents*

Signs of Interest	**Examples of signs of interest from data**
Time Spent	30 out of 40 minutes during work time
Questioning	"Was it all that oceanic stuff that was going down, did that change the currents? … But changed that? What did that? What can do that?
Non-verbal	Gestures, voice-inflection, facial expressions
Verbal	"It's too much for my brain (laughing)." "That's huge (to self)."

Analysis of Similarities and Differences across Three Cases of Situational Interest in Terms of Environmental, Instructional, and Timing Factors

For the last piece of analysis, we use the description of each event to compare and contrast the environments, instructional tasks, and what occurred. We then use these comparisons to hypothesize how increased interest could be created in future professional development.

Comparison of Events

Across these three cases, there were many similarities and differences. By analyzing the similarities and differences we will gain a better understanding of the important commonalities across these three different situations.

There were three major categories to look at when comparing the three events: what instruction was given, what environment they were in (including what the teachers were doing), and when the events took place. These three categories were chosen as broad dimensions of factors that were relevant to the professional development activities that could also be investigated given the available data. Below I will compare these three major categories. Table 6 shows a summary of the analysis of these three categories.

Each event happened at a different time so it had its own instructional task. Below, in Table 5, are the three instructional tasks, the transcript has been shortened without losing meaning:

Table 5. *Transcript of Instructional Tasks for Each Event*

Pistachite	Dikes	Convection Currents
Ok morning session, the goal is about 45 minutes form now give or take a few minutes meeting down that way and there will be people down that way too you can't miss it. Um, that's the one place where you're going to map but that place we are going to be is about 100 yds down from that, and there will be people kind of spread out so we will help shoe you in that direction.	What I would like you to do is go out on the point, and kind of meander around… So lets do this again and kind of slow our activity of getting things on paper. So, you will make a map and last time we had a really specified area, this time we are going to do a little different and what I really don't mind is if we put these things together… make observations and really kind of get into your initial, um, drawings. That's about all I got. Use the rest of your time. And, um, if you're having a hard time finding things, we will station ourselves towards places that might be of interest.	Your task is two-fold, you want to account for some of this missing time (between time one, two, and three)… Another thing I'd think about is most of you were walking around the basalt noticed that the basalt was eroded a lot further down than the granite… what could account for that? ... Pick something you find interesting (to bring into your model)… In the end were not all going to have a complete model, were going to have pieces of a model and talking to one another we'll be able to have a more full picture of what happened here. So with that, attack.

We used these instructional tasks to compare all three in terms of the instructions to encourage the teachers to explore what interests them, the levels of freedom allotted to teachers at the different events, and the differing levels of specificity of the tasks.

In each task, the instructor told them to find something interesting. In the dikes and convection currents tasks, the instructor literally said this. In the pistachite task, the instructor did not give the teachers a specific task, instead, the teachers could just openly explore and look at what interested them.

Also in each task, the teachers were given freedom. The instructor did not expect them to know everything. In the pistachite task, the teachers had not been in the field before and the professional development was just beginning so this is implied. In the dikes instructional task, the teachers were told that it is ok to slow down on the drawings and making of inferences and just concentrate on making observations. For the convection currents task, the instructor specifically said that each model will not be complete, but all together they will have a full picture of what happened. He was allowed it to be ok to not know everything and therefore be allowed to explore things that interest them.

Each instructional task was both specific and open in unique ways. The nature of the specificity and openness varied in unique ways. Pistachite was not specific at all; the teachers had free rein to look at whatever they wanted for the first 45 minutes. Dikes was the most specific of the three events. They were told to make observations and map what they saw. The environment was what made this event have more free rein, as will be discussed later. The instructional task for convection currents was specific, but the specific instructions included exploring. The teachers are asked to create models, then to find and explore something that interested them to put into their models.

During the events, and throughout the whole professional development, the instructor, researchers, and geologists did not to tell the teachers the answers to their questions right away. Instead they asked them the question back and encourage them to explore the answers themselves. This was seen by how the instructor and geologists respond to what the teachers said and also by what the instructor told me about the professional development. This type of instruction was inquiry teaching, where students (in this case teachers) are expected to learn and solve problems by themselves.

There are many similarities and differences for each event (see Table 6). Pistachite and dikes took place outside in the field, while convection currents took place in the classroom. For each event, teachers were in groups. For pistachite, the teachers formed their own groups without explicitly being asked to form groups. For dikes, the teachers were asked to make groups and did so off of whom they were working around. For convection currents, the groups were made by whom the teachers were working with the day before. For all three events though, the teachers had interaction with all teachers, not just the ones in their group. For each event, teachers had multiple ways to access information. For all three events, teachers had access to specialists, the geologists. For convection currents, the teachers had computers to access maps from a thumb drive and the internet, as well as paper maps. For pistachite and dikes, teachers had access to the actual landscape to observe first hand the formations of the rocks. In all situations, the teachers were not being lectured or forced to sit down. Teachers moved around the room or the rocks outside and took breaks as needed. In each event though, teachers were doing different things. For pistachite and dikes, the teachers were observing the landscape. For dikes and convection currents, the teachers were creating drawings (maps and models). In all cases, the teachers were doing things that had a purpose. The teachers knew their observations, maps, or models would be used. In this case, the purpose of the professional development was to model what happened in Maine’s geologic history. The tasks in each event helped teachers to create these models.

For each event the amount of time spent on that event was unique. Each event took place on a different day and the amount of time spent on the geologic feature or phenomena was different. The event pistachite took place on the first day. The teachers had 45 minutes to explore the area around them and they chose to look and discuss this unknown mineral for 20 minutes during the 45 minutes (at this point the teachers do not know the name of the mineral is pistachite). On Day 2 the teachers had an hour to explore in the morning session and they spent 45 minutes discussing and looking at pistachite. On Day 3, pistachite was discussed with the group for 45 minutes. Taking into account the other smaller times pistachite was discussed, we know pistachite was discussed and observed for at least 2.25 hours. The amount of time the teachers were in the field where pistachite was located was 3 hours and teachers were able to reflect back on the week on Day 3 for 1.5 hours. Therefore, out of the 4.5 hours the teachers could discuss pistachite, they did so for 3 hours. For dikes, the teachers took 20 minutes to follow the dike through the woods on Day 2. The teachers also used 45 minutes out of 1.5 hours in the classroom on Day 3 to discuss following the dikes into the woods. This analysis is more complicated because the 20 minutes the teachers took to follow the dikes into the woods was not an allotted amount of time; the teachers were late to the next location. Since they only had 10 minutes to transition to the next location but took 20 minutes to make it to the next location, for analysis purposes we will say they spent 10 out of the 10 minutes for transition on the event dikes. The time spent on this event is also complicated because dikes were a topic of the professional development. We know the teachers took 30 minutes out of 45 minutes on Day 1 to discuss the dikes they then followed on Day 2. Therefore, out of the 2.42 hours the teachers could discuss dikes, the teachers spent 1.83

hours doing so. For convection currents, the teachers discussed them for 2 hours out of the 3 hours allotted to work on the models and there was a discussion for 15 minutes on convection currents during their presentation of their model, and the presentation was a total of 20 minutes. Therefore, out of the 3.33 hours the teachers could spend discussing convection currents, they spent 2.25 on the event. For a summary of these numbers, see Table 6.

For each event, the teachers came back to the topic. Pistachite was seen each time the teachers were in the field, along with being discussed at lunch, breaks, and on Day 3 when reflecting on the week. Dikes were a topic of the week so it had been discussed the whole week. The dike the teachers followed was the same dike they had seen the day before. The teachers also reflected on this event on Day 3. Convection currents occurred on Day 3 so there was less time to come back to the topic. However, the teachers still were able to come back to that topic because they presented their model and during that presentation there was another discussion of convection currents among the other teachers and the geologists.

Table 6. *Summary of Similarities and Difference Among the Three Cases*

Topic	Similarity or Difference	P	D	CC
Instructional Task	Encouraged to find something interesting	√	√	√
	Teachers are not expected to know everything	Implied	Explicit	Explicit
	Level of Specificity- Task type	Open	Specific	Specific
Instructors and Geologists	Asked questions instead of answering questions	√	√	√
	Inquiry teaching	√	√	√
Environment	Outside- in the field	√	√	
	Worked in groups of 3	√	√	√
	Had interaction with all teachers	√	√	√
	Had ability to move around	√	√	√
	Access to material	√	√	√
Timing	Time spent on each event out of the amount of time possible to spend on each	66%	76%	68%

Were able to come back to topic of interest	√	√	√

Next Steps: Implications for Future Professional Development

There are three main categories of similarities among the events that we hypothesize will lead to increased interest in future professional development. They include: instruction, environment, and timeline.

Instruction includes the instructional task given at each event and the interaction between the teachers, instructor, and geologists. In each event, teachers were given an open task. They were asked to explore a topic and they were not given the answers when asked. They were encouraged to find the answers on their own and to look at things that interest them. Each event was interactive. Teachers discussed with each other, the instructors, geologists, and material provided.

The environment includes what the teachers were doing and the interaction with each other. Teachers discussed with each other and interacted with people from their group and other groups. In each event, they were able to take a break from the task at hand and necessities were provided to them, such as water and snacks. Each event also had the teachers moving around. Outside, there were moving around the rocks to look at different sections. Inside, they moved from their table to another table in order to look at more maps and stood up, as they needed in order to discuss with each other more freely.

Timeline includes the amount of time spent on the topic and the ability to come back to the topic of interest. In each event, teachers were given at least two hours during that instructional task. This was all the time in general, not just the amount of time teachers were spontaneously interested in the event. For pistachite, this happened throughout the first two days. For dikes, this was done on the first day and then again on the second day. For convection currents, the teachers were given a two-hour block to work on making the models that included convection currents. The teachers were able to come back to each event as well. For pistachite, they saw it over and over again while in the field and the discussion about it continued to come up. For dikes, they came up as a point of interest on the first day, then the teachers were able to explore where they led to on the computers during free time, and then were able to chase the dikes into the forest on Day 2. Convection currents came up on the last day with little chance of the topic being able to come up again, but the topic was discussed after work time when the teachers were presenting their models, and this discussion included many of the teachers not in the original group.

From these categories, we hypothesize that an open instruction of inquiry teaching, an environment where teachers can move and interact with multiple people and elements, and the ability to stay on a topic or come back to a topic will lead to increased interest in future professional development. Table 7 gives this summary.

Table 7. *Three Major Categories of Similarities Among the Events*

Instruction	Environment	Timeline
Open tasks	Peer interaction	Over an hour
Asked to explore	Ability to take a break	Coming back to topic
Asked to find what interests them	Kinesthetic	
Inquiry Teaching	Access to multiple ways to interpret information	
Interactive		

Discussion

Comparing Our Signs of Interest with Existing Literature

Though the signs of interest were created from bottom up coding, this section discusses those signs as being sufficient by comparing the signs of interest with other research and explaining how other studies on interest capture interest for their findings.

Finding research to compare to this case study has been difficult. According to Pressick-Kilborn and Walker (2002), who discussed a sociocultural approach to researching interest in the classroom, this is because “educational research has provided limited insight into the ways in which interest is created and develops in authentic learning environments over time. Although a focus on authentic contexts for learning is emerging within motivational research.” Therefore, the articles used to compare the coding of this research to others span to engagement and motivation as well as interest.

In this study, we used bottom up coding to express signs of interest. Looking at other research in different context, the same signs, as well as different signs, of interest were used to show interest. Azevedo (2011) uses similar codes to describe individual interest. His case study was based on a 14-year-old boy who showed particular interest in model rocketry for an extended period of time. The study took place at a model rocketry club over three years. Unlike our study, that study involved a middle school student and Azevedo (2011) coded for signs of individual interest, which is persistence in open-minded, self-motivated practices for an extended period of time. He also gave evidence of interest for different categories of rocketry the boy was interested in, such as the materials he used and how competent he felt building the rockets. Azevedo coded for two major signs, time spent on a task and verbal signs of interest as it pertained to category he is referring to. To show that the student was interested in the materials of rockets, Azevedo indicated the amount of time the student spent building the rockets as well as the time he spent fixing the rockets. Azevedo coded verbal signs of interest differently than we did, because he linked it to a specific category of rocketry. For example, he codes phrases such as, “I can do that!” to show competency. Though Azevedo’s study is not in the same context as ours, he coded for the same signs of interest as we do in this study.

A bottom up coding scheme and defining the signs of interest using the data presented in the study is a common method used in studies on interest. Therefore, specific signs of interest are often different from study to study. For example, in another article, Azevedo (2006) investigated the dynamics of student engagement. The study focused on 19 students from grades 7-11 who took a 6-week summer course. The study looked at self-directed, self-motivated, computer-based scientific image processing activities. After looking at the data, Azevedo coded for four signs of engagement: would choose the activity given a choice, would persist in activity given a choice, invests personal resources (such as effort) in the absence of coercion or outside incentives, and has a positive effect towards the activity. These are very broad codes that encompassed the students’ feelings towards the activity they are doing. This type of coding was quite different than the coding scheme we used in our research and different than Azevedo’s research presented in the previous paragraph. Similarly, Nolen (2007) has a different coding scheme based on the data she collected on young children’s motivation. The purpose of the study was to analyze motivation for literacy (reading and writing) as children progress from grades 1 to 3. The data set included video data from lessons, and students and instructor interviews at the beginning and end of each year. Because of the interview questions, Nolen coded for what the students said they specifically liked about reading and writing. She categorized her questions into interest, topic, genre, and activity and then used the video data to confirm the students' answers. Her data allowed her to code for specific topics because she asked question on the specific topics. Our study and Azevedo's studies, cannot code in this way because of lack of that data.

The coding scheme for this case study is both similar and different from other coding schemes about interest. Other signs of interest that could have been used to code interest include stance and body position, but many similar types of interest are congruent with other researchers' data sets. Research in this field, similarly to motivation and engagement, is coded in based on the data given and is not coded in the same way. These codes, such as with how our research was coded, are based off the data collected and the purpose of the research. There are many ways to capture interest, and how the evidence is captured depends on the particulars of the study, including the goals, aims, and nature of the data.

Personal Interest and Situational Interest

Though our study revolved around interest where teachers became spontaneously interested in a particular subject, there is evidence that personal interest is also present. Personal interest, as stated before, is characterized by intrinsic desire to understand a particular topic that persists over time. The occupation of the participants and the interview by Teacher K indicates that personal interest did occur as well as situational interest.

The participants in this study are all middle school science teachers. Using the definition for personal interest, this indicates that the interest they are showing for science and learning about since persists over time. They have dedicated their careers to learning and teaching science. We make note that this is a generalization of teachers and we did not test the teachers in this study to verify their motivation or interest in teaching. Also, in the post interview with Teacher K, she states that she wants to continue to research how far inland the dikes go. She states, "I'm still really interested in how far back the basalt intrusions go. You know can we find those anywhere else on the peninsula? Are they up high? … I think that would be really cool." Though this indicated personal interest, she also states, "(I was intrigued because) it was realization, I don't know if that was what is was but it was like HEY wait a second!" This indicates that the immediate interest was spontaneous and situational but the continual want to pursue this further means it is now personal interest. This is an interesting finding but unfortunately this is the only post interview we have so lack of data prevents us from pursuing personal interest any farther than this.

Even with these findings, situational interest is still the best fit for this data. The purpose of this research is to analyze why teachers became spontaneously interested in a particular subject. We want to analyze the outside factors that have an effect on interest and utilize these findings in future professional development workshops. Therefore, analyzing these data for situational interest shows the best results for purpose of this research.

Implication in My Future Teaching

Though this research was conducted with teachers in a professional development setting, the analysis could be applied to my future teaching of mathematics with middle school students. Based on my experience teaching and communicating with students, math is often not of interest to most students. Through the findings in the research, I hope to increase the level of interest and therefore learning by experimenting with how to most effectively control the instruction, environment and the time allotted on tasks.

Findings from this research are congruent with my experience in a middle school classroom. Math was taught through inquiry teaching and students were asked to explore concepts before the teacher went in depth with the concept. Math, in general though, is a subject with fewer opportunities to work with in a hands-on manner. In math it is seemingly more difficult to ask students to openly explore what they find interesting, such as teachers were asked to do in this study, would be difficult to do. However, by knowing how my students think I will be able to add hands on experiences that I will predict they will find interesting. This will have to be done by implementing different hands on lessons and informally analyzing the students for signs of interest. For example, I allowed students to add pennies to a chessboard, doubling the amount of pennies on each square, to show exponential growth. This was done with great success. Also using this example, any activity that was interactive and got students moving increased interest, which is congruent with this study.

Environment is another huge contributor to the classroom dynamics. Applying the findings of this research will be helpful in creating an environment where students can roam more freely and work within groups. Students need to interact with others and have the ability to move around. If this is a factor for teachers in a professional development, it follows that it would be a factor for a group of energy-filled students. I had not considered the influence of having the ability to take a break and having access to multiple types of information. Having an open policy of signing out to leave the classroom seems more important now, as long as it coincides with school rules. As for having access to multiple types of information, students from field experience had access to IPad apps, math books, the Internet, other students, and the teachers. Looking back now I realize that most students did value all these resources. I know this because most utilized all of these different ways to access information. When researching a project, students interviewed teachers, looked up information on the internet, went to the library, and accessed booked in the classroom. In math class, students used their math books to solve problems, did every day computation problems on a mathematics app on their IPads, and discussed problems with each other. For all subjects in school, students were given access to apps that related to the subject. Some were meant as educational games and some for research. A majority of students were on these apps during free time.

Though this research found that having the ability to spend a significant amount of time and having the ability to come back to the interesting topic was a similarity amount the three cases, this seems less applicable to apply to future teaching. I say this because of logistics. From what I know of teaching, there is a lot of material to cover in a relatively short amount of time so concentrating on one topic because it is of interest to the students is not possible. I do agree with coming back to topics though, especially in mathematics when concepts build off of each other. Also, if students become interested in a non-mathematical concept, bringing that concept into new topics in math as they relate is something I can do.

The findings in this research will be applied to my future teaching. Instruction, environment, and timing have already played a role in student interest in the classroom.

Future Research With This Data

If I were to continue working with this data set, my next step would be to implement the list of similarities and test the interest in a controlled environment. I would conduct pre and post interviews with the teachers to analyze the amount of personal interest teachers start with and to be able to explicitly ask what teachers were interest in. This research could also be tested in a classroom environment. Most research on interest is tested in a more controlled environment. Therefore, we do not know if the results correlate to actual learning environments that are more complex. Testing could therefore be done in the classroom, then compared to research that has been done in a controlled environment. Testing the list of similarities in an actual classroom or during a professional development would give an interesting data set because the conditions are controlled but they are implemented in an actual learning environment where the instruction would have taken place regardless.

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APPENDIX

Full Transcripts

Day 1 Analysis

Day 1 Morning- In the Field

Pistachite Instructional Task

1	Instructor:	Ok morning session, the goal is about 45 minutes from now give or
2		take a few minutes meeting down that way and there will be people
3		down that way too you can't miss it. Um, that's the one place
4		where you're going to map but that place we are going to be is
5		about 100 yards down from that, and there will be people kind of
6		spread out so we will help to shoe you in that direction

Pistachite- Event

7	Teacher M:	Look at these ripply things in there
8	Teacher G:	Oh yeah yeah! That could be, um, that’s liken.
9		Yep that’s liken, the green. It's probably gotten into the cracks and.

Day 1 Afternoon- In the Field

Pistachite- Event

10	Teacher G:	I hope we talk about pistachite

Day 2 Analysis

Day 2 Morning- In the Field

Dikes- Instructional Task

11	Instructor:	The older stuff we will call time 1, the middle stuff, time 2, and the
12		middle to younger stuff, we will call time 3. What I would like you
13		to do is go out on the point, look out for slicker places, and kind of
14		meander around, and we would like you to make a map and it's
15		good to make maps and make drawings. We know this because we
16		start to see things and sometimes when we start with observations
17		first, and not just write the inferences, we start to see things we
18		wouldn't otherwise. So lets do this again and kind of slow our
19		activity of getting things on paper. So, you will make a map and
20		last time we had a really specified area, this time we are going to
21		do a little different and what I really don't mind is if we put these
22		things together and maybe highlight a lot of, and teachers if they
23		want (inaudiable).. Make observations and really kind of get into
24		your initial, um, drawings. That's about all I got. Use the rest of
25		your time. We have about 20 mins probably. And, um, if your
26		having a hard time finding things, which I don't think you will, we
27		will station ourselves towards places that might be of interest.

Dikes- Event

28	Teacher K:	That looks like a big dike over here.
29	Teacher H:	Yeah
30	Teacher K:	I wonder if its going in the same direction. It almost seems like it's
31		going this way. But I don't know in relation to the..
32	Teacher H:	Well what direction was north before?
33	Teacher K:	I don't know, I mean I don't have my compass with me
34	Teacher H:	Yeah that's what we need, that's one thing we should have had.
35	Teacher K:	I had one. I had on in my backpack. I carried it around and I should
36		have used it yesterday. Cause I wonder if we should go grab it now
37		cause we're going to go back to the point right?
38	Teacher H:	Yeah we're going to go back to the point.
39	Teacher K:	So maybe I should..
40	Teacher H:	Someone has one though.
41	Teacher K:	(calling out to geologist) do you have a compass?
42		(to Teacher H) so then we can measure… cause we should measure
43		the scratches too
44	Teacher H:	yeah, yeah lets do…
45	Teacher K:	we'll do that
46		(murmuring)
47	Geologiest:	what would you like to measure?
48	Teacher H:	The direction of our scratches
49	Teacher B:	of the scratches and then our dike
50		(murmuring)
51	Teacher K:	We don't know but were thinking.
52	Teacher H:	That there are shallows, over here
53	Teacher K:	These little guys
54	Geologist:	These guys?
55	Teacher K:	Yeah!
		(murmuring; instructor speaking in background)
56	Geologist:	Northeast, southwest
57	Teacher K:	Ok. Northeast, southwest, ok.
58	Teacher B:	ok I got my scratches going here, soo this is going northeast?
59	Teacher K:	Mhmm
60	Teacher B:	Ok
61	Teacher H:	What did you see over here? What did you see? What did you see?
62	Teacher K:	And then we were wondering about the dikes..
63	Teacher B:	The dikes (at the same time as teacher K)
64	Teacher K:	Cause we want to compare those to the point
65	Geologist:	(inaudiable) to do that (inaudiable)
66	Teacher K:	So he had a good diet! Dinner, it sounds like it was pretty good!
67		(discussing scat and someones scat collection)
68	Instructor:	Has everyone had time to make some observations? .. Ok so we're
69		going to slowly start migrating back towards the vehicles
70	Teacher K:	(Teacher J) (whistpering), (Teacher J)

I want to show you the seagull feathers, and the bear poop and the crabs and everything else
(murmuring)
Teacher H: These are just totally different aren't they?
Teacher K: They look totally different. Is it because they are wet? They look so much darker, and it's cracked differently. But up there is it more uniform. This part is just really neat.

Don't step on that it will take you for a ride! (laugh)
Got it on video? Alright!
Yes, southwest northeast.
See it doesn't make sense though cause the scratches were going that way. There northeast.. So.. Maybe it was southeast.
Doesn't it look different?
But then when you get up further in that one it looks similar
I know but up there it is smootherrr?
But it's, but if you follow this one up that wayyy
It seems to get darker too, but it's still not as dark as this.
Teacher H: But it also looks a lot more, like pressured
Teacher K: It's jagged and busted, even where its chunked there it looks like a different chunking than here. This is very, it goes this way,
Teacher H: It's different ages
Teacher K: Could be.
Teacher H: Alright so this one is real cut up, chunky… I got to come back and take pictures
(scratching sound, making shades of rocks)
Teacher H: (Geologist) we are observing that that is older than that one
(discussion on how old rocks on in relation to each other)
Teacher H: (Teacher Y) is my ride.
Teacher K: (Teacher O) is my ride. I don't think she would leave without me.
Teacher H: Look at the scratches on here.
Teacher K: Oh see yeah I drew that last time! That's in my other notebook.
Teacher H: Right there, that's melted into the… That looks like basalt going into the granite, because of the little thing going into there, doesn't it?
Geologist: We saw a lot very similar stuff to that at the point, yeah
Teacher H: Right.
Teacher K: I have that in my other notebook. Last time we were here I drew that. I couldn't remember where it was though. There. Alright I'm going to go find (Teacher B).
(talking in background, sounds of walking)
Teacher K: ME! That's what I was trying to figure out this morning. If we went inland more would we see it.
Teacher B: I mean it could go way, way, way, way..
Teacher K: I mean it could continue, I mean who knows how far
Teacher H: Oh yeah

Teacher K: It's dark
Teacher B: I branch of it, yeah.
Teacher K: NEAT!
Teacher H: That's pretty cool.
(footsteps, 50 seconds)
Teacher K: Alright, we got sidetracked by following the dike up into the woods. It was very exciting to watch the dikes cross the road
(footsteps, wind, 30 seconds)
Teacher K: That's why I thought it was diabased yesterday, cause I've always heard that it's diabased.
Teacher B: But he's also said this isn't all right
Teacher K: (same time as Teacher H) Yeah well that's what he said yesterday
Teacher H: (same time as Teacher K) Yeah that's why I wanted to…
Teacher K: Yeah I thought he, yeah I thought he was just tricking us yesterday to say oh don't read that it's wrong but (inaudiable, wind)
Teacher H: That's a piece of Lasern granite right there
Teacher K: Yeah that's lopped oveerrr.. Where is that? Is is just this way or that way, I just can't, I can't remember
Teacher H: We saw some of this over at the other place too.
Teacher K: Such a miss match!
Teacher B: Over there.
Teacher K: Amazing! You know there was some Acadia granite over there and.. (inaudiable, murmuring)
Teacher N: So (Teacehr K) ths is a continuation of that piece over…
Teacher K: Yeah! And it goes right, yeah! It goes across.
Teacher B: Yeah exactly
Teacher K: Yeah that's what caughty my eye, I was like that's the one that goes down next to the sea there
Teacher H: It's probably underneath here too.
Teacher N: Oh yeah.
Teacher K: Oh I'm sure, sure. It goes right through. I mean they did just pile those rocks but if we pulled those and looked underneath the pavement (others speaking with her), yeah pavement.
Teacher H: Beneath the other.
Teacher K: Oh I'm sure, it's there.
Teacher B: That was really cool.
Teacher H: So what is our task here?
Teacher K: I'm not sure.
Teacher B: Whoops
Teacher K: .. Should pay attention. See if we see teachers from before, at the other place. We got to get (geologist), get (geologist), to um, use his compass and tell me the directions the dikes are going.
(walking, 15 sectionds)
Teacher K: Where is that boulder? I can't remember whether it's this side of the stairs or that side of the stairs.

Teacher B: (same time as Teacher H) the eratic
Teacher H: (same time as teacher B) the side of, yeah
Teacher K: (interrupt teacher H) that big beautiful erratic. I always get
disoriented when I get down here to which side of the stairs it is.
Teacher K: (geologist) can I get you to get a direction on the dike for me?
Geologist: Yeah. Did you write down what we had last time?
Teacehr K: Yeah
[official back with whole group, instructor explains task to those that just showed up]

Pistachite- Evidence of Interest

Teacher H: I just noticed over here, the basalt with the white lines.
Teacher K: Yep there is a whole squiggle of it in there… there is some more of
it over. There it's just not as prominent. It looks more like granite.
Teacher H: yeah I asked that but this looks more fine…
Teacher K: oh yeah like chalk or something
Teacher H: I mean I know it's not but

Pistachite- Evidence of Interest

Teacher G: Ohhh ho ho, this looks like pistachite. Yeah that's not liken that's
crystals. That's not vegetable!
(to whole group) There's pistachite here!
Teacher V: There is a huge patch over here.. Oh yeah look at that!
Teacher P: That is so awesome
Teacher V: It's probably everywhere here.
Teacher G: Oh cool. Look at the size of the crystals on that!
(more voices appear on recording)
Teacher L: I want to see I want to see!
Teacher V: Oh yeah, you can see it everywhere now!
Teacher G: I'm glad I got to see more of it.
(to another teacher) Did you get to see that stuff (Teacher N)? first
Isn't it cool? And see it's going all through here. And deseavingly at
it looks like liken. And see there is some big crystals there.
(to a different teacehr) Did you get to see the pistachite? It's going
through all the granite over there.
Teacher Q: (yelling from far away) Over here there are new big crystals,
raised, and a different color!
Teacher G: Wowwwww

Day 3 Analysis

Day 3 Morning- In the Classrom

Convection Currents- Instructional Task

Instructor: Just to be clear, you are going to use some of this extra information to fill in the gaps between these times. Put up some hypotheses for what the heck happened to all that stuff that Carla had talked about, that stuff happening, where is it now? A few other things, Sam um if you want to show them what you saw..

(Sam discusses what he say in the field)

so I guess your task is two-fold, you want to account for some of this missing time, ok, what happened between time 1 and time 2, what happened between time 2 and time 3, and that's one type of revision you are going to be doing. The second type of revision is, Sam made an interesting observation, he just shared it with you, saying 'hey I just figured out there's these dikes are different ages here their not all the same age. This might be something else that you dig in to time 2 and say huh, time 2 might look a little bit different, there might be an earlier time 2 and a later time 2. Um, some of you talked a bit about pistachite, where the heck does that fall into your models, I don't know where it goes. Um, other observations some of you had made, you had said that, um, oh there are these black blobs in the white rock over there, that are different than the white granite that's sitting in the black rock which you know why it's there pretty much. Geez, how do you account for that over there, what's old or what's younger. Another thing I'd think about is most of you were walking around the basalt noticed that the basalt was eroded a lot further down than the granite and we can't say because the basalts been there longer because we know the granites been there longer so what could account for that. These are all things you can bring into your model. I would say don't do all of these, pick something you find interesting, two things that you find interesting and kind of start working on those. In the end were not all going to have a complete model, were going to have pieces of a model and by talking to one another we'll be able to have a more full picture of what happened here. So with that, attack.

Convection Currents- Evidence of Interest

Teacher K: from when the plates were coming together, to when the plates pulled apart, what was going on? We need to look for evidence of that happening.

Teacher K: the convection currents…

Teacher G: it takes a lot for them to get going again

Teacher K: the convection currents, well something happened. Somehow the convection current had to have changed direction because their coming together, and they're going this way so what caused that. Was it all that oceanic stuff that was going down, did that change the currents? Because we have that whole section of oceanic crust that went down, and that might be where the basalt came from and then started pulling apart again. But changed that? What did that? What can do that? Because it had to have changed from going like this to be going like this (hand motions)… That whole oceanic that went down caused something to..

Instructor: Lots of hand motions there. Must be interesting.

Teacher K: I'm talking about the convection currents changed directions because when they collided that whole oceanic got absorbed down into the currents, at least up here we looked at (?) at least a part of that oceanic got stuck up in if you look at all that limestone and stuff in that time period. But at some point, down in here, the currents reversed and started to come a part. What caused that? Was it the density of the oceanic stuff? And how long of a period?

Instructor: if its doing this here, then what does it have to be doing somewhere else? It's not just this changing

Teacher K: no everything had to change, I mean that's hugggeee. How the hell did that happen though? It's too much for my brain (hands to head, laughing)

Instructor: hey, write that down, maybe that's something we can tackle during a cohort meeting

Teacher K: that's huge (to self)

Teacher K: but that's what's happening down below but there has got to be something that got deposited there but what got deposited? Can we look at Connecticut, can we look at New Brunswick and say there were these other rocks, any sedimentary rocks that were deposited at that point that may have been covering this area? Or even [England or Inland] or anything?

Teacher K: But then there is something about the convection currents

Teacher K: Somewhere during that 2 million years it changed direction. Whether it was closer to here or closer to here we don't know but somewhere in there, and it was probably a very long time. Things may have been very still up here while this sandstones getting laid down because this is positioning and, think of the lava lamp, maybe? Lava lamp isn't always smooth. It does change around and mixing and then it starts to get going again (hands up and down in opposite directions). Let's do that! We will explain that (hands up high, up and down). Our models are bodies, were living models (moving whole body). It's uh, it's uh (scrunched up face)

Day 3 Afternoon- In the Classroom

Dikes and Pistachite- Evidence of Interest

Instructor: I'm interested of a time that you were just like oh man I'm getting something I didn't get before, or huh…

Teacher B the thing that I mentioned was when we went back out to the point and we had been looking at the big dike that's (?) and we here, back in here in between, and we could see that oh well that looks like it somehow at where we are right this minute (in the classroom) so when we got down there even though you went back to the beach and most people did what they were suppose to.

Teacher K we went (pointing and laughing)

Teacher B we went the other direction so we could check out the upper parking lot and saw it went beyond that and we were like ah (?) so then we went around the corner (hand motions: pointing forward, then strait ahead and to the left)

Instructor: so there you were at first making your model here and then you looked at the thing online and were like 'huh that looks like here'

Teacher K: see if it does

Teacher G: did it?

Both K/B YEAH!

Teacher K: right up into the soil, the hill, and the parking lot

Teacher G: you could see that fair? (hands up and strait, showing distance?

Both K/B: yeah!

Teacher G: (head nodding)

Teacher K: its right there at the stairs, right that one big thing.

Teacher G: (sits up and turns towards Teacher K)

Teacher K: So then you go to the first part of the line, ok, and then you go up those stairs to the next parking lot.

Teacher G: (nodding head) yeah

Teacher K: there's the blueberries and other stuff you can see. Go into the blueberries, so go around (fingers pointing ahead, one hand goes around her head) so you see it coming out (hands pulled in), and then across the road and it goes up into the hill (hands go out strait).

Instructor: so that was a cool discovery

Teacher G: (while instructor is talking) how dare they put a parking lot over there! (hand slams on desk)

Instructor: so what did that make you think about, while you were doing that?

Teacher G: what the heck was going on back then?

Teacher B: when we were at the beach, to me, I was more just contained in what

Teacher K: we were… (interupts Teacher B but is inaudiable)

Teacher B: looking at there, you know, and you know, it looks like its narrows there (hands coming together) and it looks like it's getting bigger, but it wasn't really, I wasn't *able* to think, so how many (thumbs pointing backwards over shoulder) miles does it go inland, or how far into the ocean…

Teacher K: or in the ocean!

Teacher B: you know, I couldn’t, I couldn’t explain my thinking there. And then when we could look online and then go back down and check that out, it really does go in and out!

Teacher G: I feel kind of stupid cause I was thinking it was suppose to be, you know we kept, this goes back to that whole pistachite thing and the quartz layer too (hand motion in a strait line in front) and at first I didn’t really see those and I wasthinking you know I must be stupid for finding what that whole old, middle aged rock is, why am I not finding the young stuff (hand in air motioning). And then I saw that and that was really cool.

Instructor: the pistachite cutting across

Teacher G: yeah (circular hand motion on table) and it just, and those lines of what were going through at first, it was kind of deceiving because you couldn’t tell, you know, whether it was just, umm, you know some, perhaps some sort of thin granite of some sort or, but then it went, it clearly went through all those rock, and then, everywhere (big hand wave across body)

Instructor: mmhmm

Both K/B: yes

Teacher K: yeah yeah you were obsessed

Teacher G: and it was amazing to me

Teacher B: cause it was something we had never even heard of

Teacher G: it was so cool to see the different sizes of the crystals I knew that, you know, crystallization is, comes from a reheating of something or minerals that you didn’t see before but I just didn’t expect to see those crystals everywhere you know, I thought that’s so cool that’s not liken.

Teacher R: the stuff that looked like the dead liken? That was pistachite?

Teacher G: some of it, yeah, if you felt it you could see it, you could see the crystal in it, if you could see any kind of crystalline structure. It wasn't just liken

Teacher B: I went down with some people, to the first stop we made yesterday, and there was some flat rock (inaudiable).. By the stairs and I pointed that out to Gail. Liken in the cracks.

Teacher G: And some of it

Teacher B: Yeah! And (inaudiable)

Teacher G: This doesn't look like liken. And some of it there was liken near by, you know

Teacher B: yeah

Teacher G: And if you didn't get down on it, looking at it from five feet away, you don’t see it at first. And really get down and look at the pattern of it and it was crystalline! Cause I know what a liken looks like when I get right at it.

Teacher K: Oh yeah we can touch it and you're going to feel it and it's going to crumble or

Teacher G: Just lookin at it I can see, that's crystalline!

Interview- One Month After Professional Development

Dikes, Pistachite, Convection Currents- Evidence of Interest

Teacher K: I know a couple people were stuck on it. And then of course (Teacher G) with her pistachite. Of course that was a totally different thing but, um, there was definitely good science going on.

Instructor: Another question to thinking from awhile back, so thinking throughout the process, you developed a series of models, and in the end I think your final model had like three time periods or there may be even some more cause I remember there were some..

Teacher K: Yeah somebody's clothes line

Instructor: … long lines. Tell me a little bit about what you can remember about the steps and missteps about getting into that final model.

Teacher K: Alright we had, er, alright we had our first model. I can't remember what time period that was, um, but we went… k there were converging plates and then the plates diverged and there was that wholee thought process to see in the middle well how did that happen and why did that happen? And we hadyou know, this basalt coming in and how could that have come in at a different time when and the whole erosion of it. So that was a huge debate and discussion around the three time periods that we did and I think the glacial piece is the easiest for people to see, um, so I don't think that had as muchdiscourse? As the other two time periods to try and figure out well what, what was first, what was second, um, I think it was easy enough for people to understand or we got to the point where the basalt came up through the granite what HOW exactly that happened was, the took awhile to get to that point ok well if something is doing that, you know, pushing towards each other, you know, how, what was the process you know, how all of a sudden, well not all of a sudden but how does it go the other direction? So that was a BIG thing about well what's happening down the mantle? Is it happening in the mantle or is there some other thing or episode that caused the plates to now be moving in a totally new direction and cause different formations and different things coming up from down deep in the Earth.

Instructor: It's interesting I almost wish I had a video camera

Teacher K: Cause yeah I'm using my hands, I do I am, I'm very action oriented. So to have them come together and then at some point they went the other direction and how the forces deep down were doing that so there was, there was a lot of discussion and to try and get that we were all on the same page about well how does that happen or is there a time period or what are the causes.

Instructor: So do you feel that the process of kind of figuring out what other build people had and what you had, how did that help you to kind of later your final model?

Teacher K: I think that whenever you do that you kind of steal from other people it and think oh that's an idea I hadn't thought of or that was what I was trying to think of but I couldn’t quit grasp it and they were able to do that and get those other ideas and to see how they drew it made our represent it was like OHH that's how you draw it and some people had cross sections some people had aireal, more aireal views and I think it made, to seee someone elses perspective and how they thought through made it so that we were able to fine tune ours a little bit more, like OH I like that idea how can I put that in mine or oh i really don't like how that works, um, so the more people that I can hear from, their perspective, makes it easier for me to clarify my perspective

Instructor: So I guess thinking about that, at the very beginning I remember most everyone had, um, in order to get the basalt a convergent boundary, right? But then, then ideas changed and it was a divergent boundary, but then I think pretty much all the groups had that convergent boundary so taking everyones idea that might be difficult. So what, you know what was it in the process that kind of got you thinking oh wait it could be a different thing or

Teacher K: Trying to remember why we changed our minds or what the thought process was at that point because we were converging, I can't remember if it was type, cause we had the twoo, can't remember if it was two continential crusts at that point and then it was the realization and understanding that oh basalt is a denser oceanic so what was happening in order for that to be able to formed or created so I think it was discussions around that so, I can't remember how that transition came to be but there was...

Instructor: It's tough cause that was a long time ago

Teacher K: It was a long time ago! If I listened to our little recorders from the classroom maybe I'll remember some of our conversations.

Instructor: So I do have one last question and it also has to do with this kind of thinking back, um, can you describe a time during the summer academy when you were just into what you were doing.

Teacher K: I was into what I was doing, oh, there was a lot of times I was into what I was doing.

Instructor: But a time that really sticks out.

Teacher K: Um, I think the time I thought it was REALLY cool was when, the and towards the end of the first field trip when we were down the end of beach where we had that REALLY large basalt intrusion and we had, I think that was the first time you asked us to really look what's the cross section here going way down. And (Teacher H) and I were together we were sort of further down towards the water everybody else was looking at the aireal or looking up at the top part and we were down below and I can remember being really excited ok if we cut this how far down is it going to go and we were really excited about well what would this be and what would that look like and well do these intrusions stay the same thickness on the way down. Do they, where's that one go because it's really skinny here but over here you can't see it so we had those little blobs that were up on top and to try to figure out how those blobs of the granite were in the basalt. it had come up around or had been broken off and..

Instructor: I remember you guys doing something with a column

Teacher K: Yeah! Cause we started thinking oh maybe it's a column and they were like no cause it's not here so it can't be a column so it needs to be just this piece you know that's imbedded in that and we were just we were so excited about that because we hadn't thought of that and I think we REALLY engaged in what we were doing to TRY and figure out how am I going to draw this? How are we going to represent this to every body else. That was, we were really into that and didn't want to, we got pulled back and we weren't ready to.

Instructor: So thinking ahead to next year, and thinking about what we did this year, where would you go with this? Like if you, is there a next step?

Teacher K: I don't know. I'm sure there is. That's why you know I lean on my geology experts because you guys have more depth knowledge to know what we don't know.

Instructor: Oh I guess I'm thinking about if there is something you might have yet been interested in, like what's going on below the ground? We didn't figure this out.

Teacher K: NO we didn't!! We didn't figure it out um..

Instructor: Is there anything like that that is still up in the air that would be cool to go deeper

Teacher K: I'm still really interested in how far back the basalt intrusions go. You know can we find those anywhere else on the peninsula? Are they up high? Are they up on Schoodic, up on the hill somewhere? Um, you know if we were able to, you know, get compass baring and we can see on the maps that yeah they go this way and could we go and explore and see if we could find pieces of them somewhere cause I think that would be really cool to see how far back or if they are not very under the soil or if they are and that was really intriging to me, that they, we get out of the van at the parking lot and we said that hey wait a second were we parked that that's part of that intrustion and we sort of blew of going where we were suppose to go and went up through the woods and followed it through the parking lot through the little island of land there and then back into the woods and it was just really neat to, uh, see that.

Instructor: A little difficult to put ones finger on it, but what about that experience was intreging to you?

Teacher L: I think it was just the realization, I don't know if that was what it was but it was just like HEY wait a second! This doesn't it isn't just up to the parking lot. These aren't just little things at the edge of the ocean. These, who knows how far back inland this goes and I hadn't thought of that beforehand because before oh yeah you just see them on these out croppings next to the water, and then to go back and then to see it on the google map that ok yeah it continuedd up the shore line and then we wanted to go on a second field trip up towards what was it Sunrise or Sunset the trail to get to those other rocks to see how it continued there and that was the ones that were visible but then we had all these other ones that were going up into the forest that, and to think when we were in more! It could be going right underneath us! And that was just, we were really focused on that and it was very intreging to me that these intrusions could be here even though I can't see them.

Instructor: So what's the network of them and to what extent and where, yeah! Very cool.

AUTHOR'S BIOGRAPHY

Jean Stevens was born and raised in Albany, Oregon. After graduating from West Albany High School in 2010, she attended the University of Maine on a full ride athletic and academic scholarship. While attending the university, she was the secretary of the Student Athlete Advisory Committee, tutored fellow students athletes, and was captain of the softball team. She graduated with a double major in Secondary Education Mathematics and Bachelor of Arts Mathematics along with graduating with high honors and receiving her athletic varsity letter. After graduating, Jean returned to Oregon to teach high school mathematics and coach.